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DIVISION 05 - METALS

SECTION 05120

STRUCTURAL STEEL

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SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC ASD Manual	(1989) Manual of Steel Construction Allowable Stress Design

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A14.3	(1992) Ladders - Fixed - Safety Requirements

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36	(1997ael) Carbon Structural Steel
ASTM A 48	(1994ael) Gray Iron Castings
ASTM A 53	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 123	(2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 276	(1998) Stainless Steel Bars and Shapes
ASTM A 307	(1997) Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A 312	(1995) Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A 325	(1997) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 500	(1999) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 572	(1999) High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 603	(1998) Zinc-Coated Steel Structural Wire

	Rope
ASTM D 395	(1989; R 1994) Rubber Property - Compression Set
ASTM D 412	(1998; Rev. A) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 471	(1996) Rubber Property - Effect of Liquids
ASTM D 572	(1988; R 1994) Rubber - Deterioration by Heat and Oxygen
ASTM D 2000	(1999) Rubber Products in Automotive Applications
ASTM D 2240	(1997el) Rubber Property - Durometer Hardness

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1998) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A5.1	(1991) Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS A5.4	(1992) Stainless Steel Electrodes for Shielded Metal Arc Welding
AWS D1.1	(2000) Structural Welding Code - Steel

FEDERAL SPECIFICATIONS (FS)

FS FF-B-575C	(1970) Bolts, Hexagon and Square
FS FF-N-836E	(1994) Nut: Square, Hexagon, Cap, Slotted, Castle Knurled, Welding and Single Ball Seat
FS FF-S-85C	(1994) Screw, Cap, Spotted and Hexagon Head
FS FF-S-325	Shield Expansion; Nail, Expansion and Nail, Drive Screw (Devices, Anchoring, and Masonry)
FS FF-W-84A	(1992) Washers, Lock (Spring)
FS FF-W-92B	(1995) Washer, Flat (Plain)
FS FF-W-100C	(1980) Washer, Lock, Teeth
FS RR-G-661	Grating Metal, Bar Type (Floor Except for Naval Vessels)
FS TT-P-86	Paint, Red-Lead-Base, Ready-Mixed

1.2 GENERAL REQUIREMENTS

Structural steel fabrication and erection shall be performed by an organization experienced in structural steel work of equivalent magnitude. The Contractor shall be responsible for correctness of detailing, fabrication, and for the correct fitting of structural members. Connections, for any part of the structure not shown on the contract drawings, shall be considered simple shear connections and shall be designed and detailed in accordance with pertinent provisions of AISC ASD Manual. Substitution of sections or modification of connection details will not be accepted unless approved by the Contracting Officer. AISC ASD Manual shall govern the work. Welding shall be in accordance with AWS D1.1. High-strength bolting shall be in accordance with AISC ASD Manual.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Structural Steel System; G
Structural Connections; G

Shop and erection details including members (with their connections) not shown on the contract drawings. Welds shall be indicated by standard welding symbols in accordance with AWS A2.4.

Miscellaneous Steel and Metalwork; G

Shop drawings of miscellaneous steel items.

SD-03 Product Data

Erection

Prior to erection, erection plan of the structural steel framing describing all necessary temporary supports, including the sequence of installation and removal.

SD-04 Samples

High Strength Bolts and Nuts
Carbon Steel Bolts and Nuts
Nuts Dimensional Style
Washers

Random samples of bolts, nuts, and washers as delivered to the job site if requested, taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

SD-05 Design Data

Manufacturer's Data; G.

Manufacturer's data for all anchor systems, including expansion

anchors and epoxy systems shall be submitted for approval prior to commencing the work.

SD-07 Certificates

Rubber Seals and Gaskets

Certificate of compliance that rubber seals and neoprene gaskets and anchors meet the requirements stated in this section.

Mill Test Reports

Certified copies of mill test reports for structural steel, structural bolts, nuts, washers and other related structural steel items, including attesting that the structural steel furnished contains no less than 25 percent recycled scrap steel and meets the requirements specified, prior to the installation.

Welder Qualifications

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.1.

Fabrication

A copy of the AISC certificate indicating that the fabrication plant meets the specified structural steelwork category.

1.4 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL BARS, PLATES AND SHAPES

2.1.1 General

Bars, plates, and shapes for all items except maintenance bulkhead shall conform to ASTM A 36 unless otherwise specified. Bars, plates and shapes for maintenance bulkhead shall conform to ASTM A 572 unless otherwise specified.

2.1.2 Structural Tubing

Structural tubing shall conform to ASTM A 500, Grade B, minimum yield strength 46Ksi, unless otherwise specified.

2.1.3 Steel Pipe

Steel pipe shall conform to ASTM A 53, Type S, Grade B unless otherwise specified. Corrosion-resisting steel pipe shall conform to ASTM A 312.

2.1.4 Pulling Eyes

Eyes shall conform to the requirements of ASTM A 36 and shall be hot-dip galvanized in accordance with ASTM A 123 and shall conform to the details shown on approved manufacturer's drawings.

2.1.5 Corrosion-Resisting Steel (Stainless Steel)

2.1.5.1 Bars, Shapes and Plate

Except as otherwise shown or specified, all plates shown to be corrosion-resisting steel shall conform to the requirements of ASTM A 276, Type 304. Bars, shapes and plates shall be hot-rolled, annealed, and pickled. Bars may be cut from the above-specified plate.

2.1.5.2 Cleaning and Passivating

The steel shall be cleaned and passivated as specified in Section 05501: METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS.

2.1.6 Spring Steel

All springs shall be of a material conforming to the requirements of ASTM A 689, unless otherwise indicated. Physical properties shall be as shown and as approved. Springs shall be heat-treated before and after forming.

2.1.7 Steel Gratings

Steel bar gratings shall conform to the requirements of FS RR-G-661, Type I or Type II, banded. All bar grating shall be of the same type. All grating shall be galvanized unless shown otherwise. Galvanized and repair of damaged galvanized coatings shall be in accordance with SECTION 05501: METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS.

2.1.8 Threaded Bolts, Nuts, Studs, Anchors and Washers

2.1.8.1 General

Unless otherwise indicated, threaded bolts, nuts and studs shall conform to the requirements of FS FF-B-575C Type III, Grade 1. Threaded nuts for general bolting, unless otherwise indicated, shall conform to FS FF-N-836E, Type II, Style 11.

2.1.8.2 Studs

Studs shall be as specified in SECTION 05501: METALWORK FABRICATION, MACHINE WORK AND MISCELLANEOUS PROVISIONS.

2.1.8.3 Corrosion-Resisting Steel

Corrosion-resisting steel for capscrews, bolts, and nuts shall be as shown or shall conform to ASTM A 276. Lock washers specified as corrosion-resisting steel shall be corrosion-resisting steel of good commercial grade.

2.1.8.4 High-Strength Bolts and Nuts

All bolted connections that are indicated or specified to be assembled with high-strength bolts shall be assembled with bolts, nuts and washers, if required, which meet the requirements of ASTM A 325.

2.1.8.5 Capscrews and Nuts

Capscrews shall conform to the requirements of FS FF-S-85C, Type 1, Style

1S, Grade 2. Nuts shall conform to the requirements of FS FF-N-836E, Type II, Style 11, carbon steel unless otherwise indicated. Material for capscrews and nuts for the maintenance bulkhead seal bars shall be 300 series, corrosion-resistant steel.

2.1.8.6 Anchor Bolts

Steel for anchor bolts without heads and with non-standard thread lengths shall conform to the applicable requirements of ASTM A 307, Grade B, with heavy series hexagon nuts, unless otherwise shown.

2.1.8.7 Concrete Anchors

Concrete anchors shall conform to the following average pullout and shear values which are values for 4,000 psi concrete. All concrete anchors shall be epoxy grouted when installed. Data on anchors shall be submitted for Contracting Officer approval.

2.1.8.8 Expansion Anchors

Expansion anchors, if required to be provided by the Contracting Officer, shall conform to the requirements of FS FF-S-325, Group II, Type 4, Group III, Type 1, or Group VIII, Type I, internally threaded, or as shown on approved manufacturer's drawings. Data on anchors shall be submitted for Contracting Officer's approval in the following table format.

Stud Diameter Proof Load Tension Proof Load Shear Safe Working Loads

2.1.8.9 Washers

Spring-type lock washers shall conform to FS FF-W-84A, Class A, Style 2. Flat washers shall conform to FS FF-W-92B, Type A, Grade I, Class A, galvanized. Tooth-type lock washers shall conform to FS FF-W-100C, Type I, Grade B.

2.1.9 Steel Pipe Handrails

2.1.9.1 General

The handrails shall be fabricated and installed as shown. The pipe portions of handrails shall be fabricated from Schedule 40 steel pipe except all posts and standards shall be Schedule 80 steel pipe.

2.1.9.2 Fabrication

Unless otherwise shown, corner fittings shall be provided with inside radius equal to the nominal pipe diameter. Posts, rails, and corners shall be jointed by mitered and welded joints made by fitting posts to top rail and intermediate rail to post, mitering corners, groove welding joints and grinding to a smooth, uniform finish. All exposed welds shall be ground smooth and flush to match and blend with adjoining surfaces. Butt splices shall be reinforced by a tightfitting interior sleeve not less than 6 inches long. Railings may be bent at corners instead of joining if bends are uniformly formed in jigs with circular cross-section of pipe maintained throughout the entire bend.

2.1.9.3 Installation

Railings shall be adjusted prior to securing in place to ensure proper

matching at butt joints and correct alignment throughout their length. Posts shall be plumbed in each direction.

2.1.9.4 Finish

Handrails shall be galvanized after fabrication including pipe, fittings, brackets, fasteners, and other ferrous metal components. Excess zinc shall be filed off for a smooth finish.

2.1.10 Welding Electrodes

2.1.10.1 Steel

Welding electrodes shall meet the requirements of AWS A5.1 for low-hydrogen electrodes, classification numbers as required for the position of welding and the material being welded.

2.1.10.2 Alloy Steel

a. Low-Alloy Steel: Alloy steel welding electrodes shall be as recommended for the application by the manufacturer of the electrodes.

b. Corrosion-Resisting Steel: Welding electrodes shall conform to the requirements of AWS A5.4. Classification number shall be as indicated or recommended by the manufacturer of the electrodes and as approved.

2.1.11 Rubber Seals and Gaskets

2.1.11.1 General

Seals shall be handled and stored in a manner to prevent damage. Seals which have been cut, torn or otherwise damaged shall not be used. Bending or rolling in tighter coils than those in which the seals are packed at the factory shall be avoided. Storage shall be indoors, in original package, and without heavy loading or exposure to oils, chemicals, vapors or ozone. Storage temperatures shall not exceed 100 degrees F. Except for durometer hardness and 300 percent modulus, all rubber seals and gaskets shall meet the requirements set forth below. The durometer hardness of such gaskets and seals, except as specifically otherwise shown, shall meet the requirements set forth herein for seals. For seals of 40 durometer or less hardness, the specified test value of 900 psi (min) for the 300 percent modulus is reduced to 400 psi (min).

2.1.11.2 Rubber Seals

The rubber seals shall be molded only and the material shall be compounded of natural or synthetic polyisoprene or a blend of both and shall contain reinforcing carbon black, zinc oxide, accelerators, antioxidants, vulcanizing agents, and plasticizers. Physical characteristics shall meet the following requirements:

Physical Test	Test Value	Test Method Specification
Tensile Strength	2,500 psi (min)	ASTM D 412
Elongation at Break	450 percent (min)	ASTM D 412
300 Percent Modulus	900 psi (min)	ASTM D 412

Physical Test	Test Value	Test Method Specification
Durometer Hardness, Shore Type A	65 - 70	ASTM D 2240
Compression Set	30 percent (max)	ASTM D 395
Tensile Strength after Aging 48 Hours	80 percent (min) of tensile strength	ASTM D 572

The water absorption test shall be performed with distilled water. The washed specimen shall be blotted dry with filter paper or other absorbent material and suspended by means of small glass rods in the oven at a temperature of 70 ± 2 degrees C for 22 ±1/4 hours. The specimen shall be removed, allowed to cool to room temperature in air, weighed and the weight recorded to the nearest milligram as W1 (W1 defined in ASTM D 471). The immersion temperature shall be 70 degrees ± 1 degree C and the duration of immersion shall be 166 hours.

2.1.11.3 Neoprene Gaskets

Material for neoprene gaskets shall conform to ASTM D 2000, 3BC620A14.

2.1.12 Zinc-Coating (Hot-Dip)

All surfaces from which galvanizing is removed during installation shall be repaired in accordance with SECTION 05501: METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS.

2.1.13 Miscellaneous Metal Items

Unless noted otherwise on the specification drawings or shown otherwise in these Specifications, all miscellaneous steel items shall conform to ASTM A 36 requirements.

2.1.14 Wire Rope

2.1.14.1 General

Wire rope shall conform to ASTM A 603 unless otherwise specified. Wire rope shall be Fiber Core, 6 x 19, two-operation classification, monitor steel or improved plow steel grade.

2.1.14.2 Fittings

Wire rope fittings shall match wire rope size and shall develop 100 percent of wire rope strength.

2.1.15 Ladders

Ladders shall be galvanized, fixed rail type in accordance with ANSI A14.3.

2.1.16 Roof Hatches

Roof hatches shall be of galvanized steel not less than 14 gauge, with 3 inch beaded flange welded and ground at corners. Roof hatches shall be of the size shown on the plans and shall withstand traffic loading where indicated. Cover and curb shall be insulated with 1 inch thick rigid insulation covered and protected by galvanized steel liner not less than 26 gauge. The curb shall be equipped with an integral metal cap flashing

of the same gauge and metal as the curb, full welded and ground at corners for weathertightness. Scuttle shall be completely assembled with heavy hinges, compression spring operators enclosed in telescopic tubes, positive snap latch with turn handles on inside and outside and neoprene draft seal. Fasteners shall be provided for padlocking on the inside. The cover shall be equipped with an automatic hold-open arm complete with handle to permit one hand release.

2.1.17 Manhole Frame and Cover

Frame and cover to access for bridge bearing pad inspection shall be cast iron conforming with ASTM A 48 Class 35B. Cast iron frame and over shall be circular and shall be of type suitable for the application.

2.1.18 Fall Prevention System

A rigid fall prevention system from manhole access for bridge bearing pad inspection shall consist of carrier rail, telescoping extension, mounting sleeve, clamps, brackets, belt, etc. All components of the system shall be galvanized steel.

PART 3 EXECUTION

3.1 PAINTING

Unless otherwise specified, painting shall conform to SECTION 09940: PAINTING-HYDRAULIC STRUCTURES AND APPURTENANT WORKS, and the applicable specification drawings.

3.2 STRUCTURAL STEEL

3.2.1 General

The items covered under this paragraph include all structural steel items as shown on drawings or as required in these specifications including the following:

1. River outlet slide gates.
2. River outlet slide gate bodies.
3. River outlet slide gate bonnets.
4. River outlet slide gate bonnet covers.
5. River outlet emergency bulkhead gates.
6. River outlet emergency bulkhead guides.
7. River outlet frames and seal seats emergency bulkhead lifting beam.
8. River outlet emergency bulkhead storage latches and accessories.
9. Maintenance bulkheads.
10. Maintenance bulkhead frames, guides and seats.
11. Maintenance bulkhead lifting beam.

12. Maintenance bulkhead storage latches and accessories.

13. Low flow outlet pipes and valves.

14. River outlet trashracks and frames.

15. Low flow outlet trashracks and frames.

16. All other structural items not specifically itemized above.

3.2.2 Trashracks and Frames

3.2.2.1 General

The alignment and dimensions of all gates, bulkheads, guides, and trashracks shall be such that proper operation of bulkheads and trashracks is assured. The guides shall be adjusted to correct position before grouting and concreting. Guides for which close tolerances are specified or required shall be installed in blockouts as shown. Guides for which no blockouts are shown may be installed in surrounding concrete without the use of blockouts, provided that the tolerances specified or shown on the drawings are met. However, to ensure proper installation, such guides may be installed in approved blockouts. Before concreting blockouts, the bulkheads shall be operated through as many raising and lowering cycles as required to assure that no binding occurs.

3.2.2.2 Tests and Trials

After concreting blockouts, bulkheads shall be tested in their appropriate guides to demonstrate that no binding occurs in the guides. All tolerances shown on the drawings or contained in the Specifications shall be met. After testing, any item that does not operate properly or does not meet dimensional tolerances shall be corrected.

3.2.2.3 Rubber Seals and Gaskets

The length of each face of seal shall be molded in one piece or made continuous by factory vulcanizing. Any such vulcanizing joint which has sufficient variation in thickness to impair the sealing functions will be rejected. Cemented splices may be used when shown. Cemented splices shall develop a tensile strength of not less than 50 percent of the unspliced section. All seals shall have been aged for 30 days or more to provide for shrinkage of the material before being assembled and drilled. Bolt holes shall be drilled to match the holes in the structural members. Rubber seals, if attached to structural members in the shop, shall be protected by suitable pads during shipment. Seals shall have molded corners vulcanized to straight sections unless otherwise detailed. Corners shall be molded in one piece, each run extending a minimum of 12 inches plus an additional length so that the splice line will avoid bolt holes in the web portion.

3.3 MISCELLANEOUS STEEL AND METALWORK

All items of miscellaneous steel and metalwork shall be provided as follows:

1. Embedded structural steel frames for openings and covers.

2. Watertight access doors and frames.

3. Roof hatches.

4. Steel pipe handrails.

5. Steel grating.

6. Steel ladders.

7. Embedded guard angles.

8. Hoisting slings and cables.

9. Air vent pipes.

10. Pendant hangers and pendants.

11. Drain and cable pipes.

12. Miscellaneous embedded metals.

13. Crane supports.

14. Manhole frame and cover.

15. Fall prevention system.

3.4 ANCHOR BOLTS

All anchor bolts shall be furnished and set, true to line and grade, for metalwork and other equipment as shown. Anchor bolts and appurtenances shall be painted with one coat of red paint meeting FS TT-P-86, Type II, immediately after removal of forms unless galvanized.

3.5 EXPANSION ANCHORS

Expansion anchors, wherever permitted by the Contracting Officer or shown on approved shop drawings, shall conform to the applicable provisions stated earlier. The type, class and style shall be at the option of the Contractor except where specifically shown or specified herein. The anchors shall be sized for the nominal bolt size of the equipment or device being attached or suspended except where specifically shown or specified herein. Where the attached or suspended equipment does not bear directly on the concrete, an OG washer or malleable iron washer, lock washer and nut shall be used to provide a constant loading on the anchor. The anchors shall be installed in accordance with the recommendations of the manufacturer. Safe working loads shall be computed at 25 percent of the proof test load.

3.6 CONCRETE ANCHORS

Concrete anchors shall conform to the applicable provisions stated earlier. The type, class and style shall be at the option of the Contractor except where specifically shown or specified herein. The anchors shall be sized for the nominal bolt size of the equipment or device being attached or suspended except where specifically shown or specified herein. Where the attached or suspended equipment does not bear directly on the concrete, an OG washer or malleable iron washer, lock washer and nut shall be used to provide a constant loading on the anchor. The anchors shall be installed using a polyester resin grout, an epoxy grout, or a cementitious grout in accordance with the recommendation of the manufacturer. Safe working loads

shall be computed at 25 percent of the proof test loads. Epoxied anchors shall not be used in suspended applications.

-- End of Section --

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DIVISION 05 - METALS

SECTION 05501

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS

-- End of Section Table of Contents --

SECTION 05501

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS

PART 1 GENERAL

1.1 GENERAL INFORMATION

This section specifies the general workmanship standards applicable to the fabrication, assembly and testing of various items of metalwork and machine work to ensure conformance with the Specifications. These requirements are in addition to those contained in the sections pertaining to the specific items of work or as shown on approved shop drawings.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B4.1	(1967) Preferred Limits and Fits for Cylindrical Parts

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123	(2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 325	(1997) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 380	(1994a) Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
ASTM A 490	(1997) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
ASTM E 165	(1995) Liquid Penetrant Examination Inspection Method
ASTM E 709	(1995) Magnetic Particle Examination

ASME INTERNATIONAL (ASME)

ASME B46.1	(1995) Surface Texture (Surface Roughness, Waviness, and Lay)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(2000) Structural Welding Code - Steel

DEPARTMENT OF DEFENSE (DOD)

DOD-P-21035	Paint, High Zinc Dust Content, Galvanizing Repair

1.3 TESTS OF MATERIALS

Material tests and analyses shall be performed as required by an approved laboratory and certified to demonstrate that materials are in conformity with the Specifications. These tests and analyses shall be performed and certified at the Contractor's expense. Tests, unless otherwise specified or authorized, shall conform to the requirements of the detailed specifications for the respective items of work. Where required, tests shall be conducted in the presence of the Contracting Officer. Specimens and samples for independent tests and analyses shall be furnished in accordance with Section 01330 SUBMITTAL PROCEDURES. These specimens and samples shall be properly labeled and prepared for shipment.

1.4 SPECIAL TEST REQUIREMENTS

1.4.1 Nondestructive Testing

When doubt exists as to the soundness of any material part, such part may be subject to nondestructive testing as determined by the Contracting Officer. This may include ultrasonic, magnaflux, dye penetrant, x-ray, gamma ray, or any other test that will thoroughly investigate the part in question. Any defect will be cause for rejection and the rejected part shall be replaced and retested.

1.4.2 Tests of Machinery and Structural Units

The details for tests on the various machinery and structural units shall conform to the requirements of the particular sections of these Specifications covering these items. Each complete machinery and structural unit shall be assembled and tested in the shop in the presence of the Contracting Officer as required, unless otherwise directed. Waiving of tests, however, will not relieve the Contractor of responsibility for any fault in operation, workmanship, or material that may develop before the completion of the contractor guarantee. After being assembled in place at the site, each complete machine or structural unit shall be operated through a sufficient number of complete cycles to demonstrate that it meets specification operational requirements in all respects.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

Detail drawings for metalwork and machine work shall be submitted and approved prior to fabrication.

SD-03 Product Data

Nondestructive Examination

A schedule showing the weld on whichever item that will be tested by nondestructive examination.

SD-05 Design Data

Lists of Materials; G

Two copies of all purchase and mill orders, shop orders for materials and work orders. At the time of submittal of shop drawings, a list shall be furnished designating the material to be used for each item. Where mill tests are required, the purchase orders shall contain the original mill test report, the test site address, and the name of the testing agency. A shipping bill or memorandum of each shipment of finished pieces or members to the project site shall also be furnished giving the designation mark and weight of each piece, the number of pieces, the total weight, and if shipped by rail in carload lots, the car initial and number. Copies of certified shipping bills, in duplicate, shall be submitted promptly.

Welding Procedures; G

A complete schedule of welding procedures consisting of detailed procedure specifications for each structure to be welded and tables or diagrams showing the procedure to be used for each required joint. The schedule shall conform to the provisions of AWS D1.1, Sections 2, 3, 4, 7, 9 and applicable provisions of Section 10. Filler metal, preheat, interpass temperature, and stress relief heat treatment requirements must be included in the procedures. Procedures must show types and locations of welds designated and/or specified to receive nondestructive examination. Procedures shall be such as to minimize residual stresses, distortion and shrinkage. Procedures shall be qualified by tests as prescribed in AWS D1.1, Section 5, except for prequalified procedures described in AWS D1.1, Subsection 5.1. Properly documented evidence of compliance with all requirements of these specifications for previous qualification tests shall establish the joint welding procedure as prequalified. Each procedure shall be clearly identified as being prequalified or qualified by tests. The test welding and specimen testing must be witnessed and the test report document signed by the Government. The Contractor will be directed or authorized to make any changes in previously approved welding procedures that are deemed necessary or desirable by the Government. Approval of any procedure will not relieve the Contractor of the responsibility for producing a finished structure meeting all requirements of these Specifications.

SD-06 Test Reports

Tests of Materials; G

The original and one copy of certified test reports and analyses for materials. Test reports for material tests and analyses shall be identified with specific lots and items prior to installation.

Disposition Records

A system of identification which shows the disposition of specific lots of approved materials and fabricated items in the work established before completion of the contract.

SD-07 Certificates

Qualification of Welders and Welding Operators; G

A complete qualification test record, as described in this section, for all welders, welding operators, and tackers before fabrication commences.

1.6 DETAIL DRAWINGS

Detail drawings for metalwork and machine work shall include catalog cuts, templates, fabrication and assembly details and type, grade and class of material as appropriate. Elements of fabricated items inadvertently omitted on contract drawings shall be detailed by the fabricator and indicated on the detail drawings.

1.7 QUALIFICATION OF WELDERS AND WELDING OPERATORS

Welding operators, welders and tack welders shall be qualified and, as necessary, prequalified for the particular type of work to be done. Qualifications shall be in accordance with Section 5 of AWS D1.1. The welders and welding operators so qualified shall be certified by name, including the date of qualification, code and procedures under which qualified. Prior qualification may be accepted provided the welder has performed satisfactory work under the code for which qualified within the preceding three months. The welder or welding operator shall be required to repeat the qualifying tests when their work indicates a reasonable doubt as to their proficiency. In such cases, they shall be recertified, as above, if they successfully pass the retest; otherwise, they shall be disqualified until they have successfully passed a retest. All expenses in connection with qualification and re-qualification shall be borne by the Contractor.

PART 2 PRODUCTS

2.1 STRUCTURAL FABRICATION

2.1.1 General

Material must be straight before being laid off or worked. If straightening is necessary, it shall be done by methods that will not impair the metal. Sharp kinks or bends shall be cause for rejection of the material. Material with welds will not be accepted, except where welding is definitely specified, indicated, or otherwise approved. Bends, except for minor details, shall be made by approved dies, press brakes, or bending rolls. Where heating is required, precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in such manner as not to destroy the original properties of the metal. Flame cutting of material other than structural steel shall be subject to approval and, where proposed, shall be indicated on submitted shop drawings. Shearing shall be accurately done and all portions of the work shall be neatly finished. Corners shall be square and true unless otherwise shown. Reentrant cuts shall be filleted to a minimum radius of 3/4 inch unless otherwise

approved. Finished members shall be free from twists, bends, and open joints. All bolts, nuts, and screws shall be tight.

2.1.2 Dimensional Tolerances for Structural Work

Dimensions shall be measured by means of an approved calibrated steel tape of approximately the same temperature as the material being measured at the time of measurement. The overall dimensions of an assembled structural unit shall be within the tolerances indicated or as specified in the section pertaining to the specific item of work. Where tolerances are not specified in other sections of these specifications or shown, an allowable variation of 1/32 inch is permissible in the overall length of individual component members with both ends milled; individual component members without milled ends shall not deviate from the dimensions shown by more than 1/16 inch for members 30 feet or less in length and by more than 1/8 inch for members over 30 feet in length.

2.1.3 Structural Steel Fabrication

Structural steel may be cut by mechanically guided or hand guided torches if an accurate profile with a smooth surface which is free from cracks and notches is obtained. Surfaces and edges to be welded shall be prepared in accordance with AWS D1.1, Subsection 3.2. Where structural steel is not to be welded, chipping or grinding will not be required except as necessary to remove slag and sharp edges of mechanically guided cuts or hand guided cuts not exposed to view. Hand guided cuts which are to be exposed or visible shall be chipped, ground, or machined to sound metal.

2.2 WELDING

2.2.1 Structural Steel

2.2.1.1 Welding Process

Welding of structural steel shall be by an electric arc welding process, using a method which excludes the atmosphere from the molten metal. Welding, unless specified otherwise, shall conform to the applicable provisions of Sections 1 through 7 and Sections 9 and 10 of AWS D1.1.

2.2.1.2 Technique

a. Filler Metal

The electrode, electrode-flux combination and grade of weld metal shall conform to the appropriate AWS specification for the base metal and welding process being used or shall be as shown where a specific choice of AWS specification allowables is required. The AWS designation of the electrodes to be used shall be included in the schedule of welding procedures. Only low hydrogen electrodes shall be used for manual shielded metal-arc welding regardless of the thickness of the steel. A controlled temperature storage oven shall be used at the job site as prescribed by AWS D1.1., Subsection 4.5 to maintain low moisture of low hydrogen electrodes.

b. Preheat and Interpass Temperature

Preheating shall be performed as required by Subsection 4.2 and 4.3 of AWS D1.1, or as otherwise specified, except that the temperature of the base metal shall be at least 70 F. The weldments to be preheated shall be slowly and uniformly heated by approved means to the prescribed

temperature, held at that temperature until the welding is completed and then permitted to cool slowly in still air.

c. Stress Relief Heat Treatment

Where stress relief heat treatment is specified or shown, it shall be in accordance with the requirements of Subsection 4.4 of AWS D1.1, unless otherwise authorized or directed.

2.2.1.3 Workmanship

Workmanship for welding shall be in accordance with AWS D1.1, Section 3, and other applicable requirements of these specifications.

a. Preparation of Base Metal

Prior to welding, the surfaces to be welded shall be inspected to assure compliance with AWS D1.1, Subsection 3.2.

b. Temporary Welds

Temporary welds required for fabrication and erection shall be made under the controlled conditions prescribed herein for permanent work. All temporary welds shall be made using low-hydrogen welding electrodes by welders qualified for permanent work as specified previously in this section. Preheating for temporary welds shall be as required by AWS D1.1 for permanent welds except that the minimum temperature shall be 120 degrees F in any case. In making temporary welds, arcs shall not be struck in other than weld locations. Each temporary weld shall be removed after serving its purpose and ground flush with adjacent surfaces.

c. Tack Welds

Tack welds that are to be incorporated into the permanent work shall be subject to the same quality requirements as the permanent welds. Preheating shall be performed as specified for temporary welds above. Such tack welds shall be cleaned and fused thoroughly with the permanent welds. Multiple-pass tack welds shall have cascaded ends. Defective tack welds shall be removed before permanent welding.

2.2.1.4 Welding Inspection

a. General

An approved Contractor's welding inspection system shall be maintained and required inspections shall be performed in accordance with his submittal and SECTION 01451: CONTRACTOR QUALITY CONTROL. Welding shall be subject to inspection to determine conformance with the requirements of AWS D1.1, the approved welding procedures and provisions stated elsewhere in these Specifications.

b. Visual Examination

All completed welds shall be cleaned and examined carefully for insufficient throat or leg sizes, cracks, undercutting, overlap, excessive convexity or reinforcement, and other surface defects to ensure compliance with the requirements of Sections 3 and 89, Part D of AWS D1.1.

c. Nondestructive Examination

1. Nondestructive examination of welds shall be performed as shown and/or described in the sections covering the particular items of work.

2. Nondestructive examination of welds and evaluation of tests or inspections as to the acceptability of the welds shall be performed by a testing agency adequately equipped and competent to perform such services; or by the Contractor using suitable equipment and qualified personnel. In either case, written approval shall be required and such tests or inspections shall be witnessed by the Government. The evaluation of the tests or inspections shall be subject to approval and all records shall become the property of the Contracting Officer

3. Examination Procedures

(a) Ultrasonic Testing. The procedure for making, evaluating and reporting the ultrasonic testing of the welds shall conform to the requirements of Section 6, Part C of AWS D1.1. The ultrasonic equipment shall be capable of making a permanent record of the test indications and a record shall be made of each weld tested.

(b) Radiographic Testing. The procedure for making, evaluating and reporting the radiographic testing shall conform to the requirements of Section 6, Part B of AWS D1.1.

(c) Magnetic Particle Inspection. The procedure for making magnetic particle inspection shall conform to the applicable provisions of ASTM E 709.

(d) Dye Penetrant Inspection. The procedure for making dye penetrant inspection shall conform to the applicable provisions of ASTM E 165.

4. Acceptability of Welds

Welds shall be unacceptable if shown to have defects prohibited by AWS D1.1., Subsection 9.25, or are shown to possess any degree of incomplete fusion, inadequate penetration or undercutting.

5. CQC System

The Contractor shall maintain a Contractor Quality Control System. Quality of welds shall be in accordance with standards found in AWS D1.1.

6. QA Program

Welds shall be subject to the Quality Assurance Program. These welds are in addition to those required by CQC and any welds designated on the shop drawings for nondestructive testing.

7. Weld Inspection

The Contracting Officer will require nondestructive inspection of designated welds and may require supplemental examination of any joint or coupons to be cut from any location in any joint. Twenty percent of weld lengths of the following list of items at locations designated by the Contracting Officer shall be inspected by nondestructive testing:

(a) Gate room stairs and platforms.

(b) Low flow outlet inspection ladders and platforms.

(c) Low flow outlet maintenance bulkhead and guides.

(d) River outlet emergency closure gate and frames.

(e) River outlet regulating gates, frames, hoists and accessories.

(f) Steel pipe for low flow outlet and valves.

(g) Ladders.

d. Test Coupons

The Contracting Officer reserves the right to require the Contractor to remove coupons from completed work when doubt as to soundness cannot be resolved by nondestructive examination. Should tests of any two coupons cut from the work of any welder show strengths less than that specified for the base metal, it will be considered evidence of negligence or incompetence, and such welder shall be removed form the work. When coupons are removed from any part of a structure, the members cut shall be repaired in a neat manner with joints of proper type to develop the full strength of the members. Repaired joints shall be peened as approved or directed to relieve residual stress. The expense for removal and testing of the coupons, repair of the cut members, and the performance of nondestructive examination of the repairs shall be assigned by the Contracting Officer to the Contractor in accordance with Contract Clause, INSPECTION OF CONSTRUCTION in Volume I of Prado Dam Specifications.

e. Supplemental Examination

Before final acceptance, the Contracting Officer reserves the right to perform supplemental nondestructive examination as deemed necessary when the soundness of any weld is suspected of being deficient due to faulty workmanship or stresses that might occur during shipment or erection. The cost of such inspection will be borne by the Contractor.

2.2.1.5 Repairs

Defective welds shall be repaired in compliance with AWS D1.1, Subsection 3.7. When deemed necessary by the Contracting Officer, a welding repair plan shall be submitted for approval before repairs are made. Defective weld metal shall be removed to sound metal by use of air carbon-arc or oxygen gouging. Oxygen gouging shall not be used on ASTM A 514 steel. The surfaces shall be thoroughly cleaned before welding. Welds that have been repaired shall be retested by the same methods used in the original inspection. Except for repairs of members cut to remove test coupons and found to have acceptable welds, costs of repairs and retesting shall be borne by the Contractor.

2.3 STUD WELDING

2.3.1 General

The requirements for welding steel studs to steel including mechanical, workmanship, technique, stud application qualification, production, quality control, and fabrication, and verification inspection requirements shall

conform to the requirements of AWS D1.1, Section 7, except as otherwise specified.

2.3.2 Stud Materials

The type, size and length of studs shall be as shown. The manufacturer's certified test reports and certification that the studs conform to the requirements of AWS D1.1, Subsections 7.2 and 7.3, shall be furnished.

2.3.3 Stud Application Qualification

As a condition of approval of the stud application process, certified results of the manufacturer's stud base qualification tests and/or certified results of the stud application qualification test shall be furnished as required by AWS D1.1., Subsection 7.6, except as otherwise specified.

2.3.4 Production Quality Control

Quality control for production welding shall conform to the requirements of AWS D1.1, Subsection 7.7, except as otherwise specified. Studs on which pre-production testing is to be performed shall be welded in the same general position as required on production items (flat, vertical, overhead, or sloping). Test and production stud welding shall be subjected to visual examination or inspection. If the reduction of the length of studs becomes less than normal as they are welded, welding shall be stopped immediately and not resumed until the cause has been corrected.

2.3.5 Fabrication and Verification Inspection and Testing

Fabrication and verification inspection and testing shall conform to the requirements of AWS D1.1, Subsection 7.8, except as otherwise specified. The Contracting Officer will serve as the verification inspector. In addition to studs that do not show a full 360 degree weld flash or have been repaired by welding, those whose reduction in length due to welding is less than normal, and one stud in every 100 shall be bent or torque tested as required by AWS D1.1, Subsection 7.8. If any of these studs fail, two additional studs shall be bent or torque tested. If either of these two studs fails, all of the studs represented by the tests shall be rejected. Studs that crack under testing in either the weld, base metal, or shank shall be rejected and replaced.

2.4 BOLTED CONNECTIONS

2.4.1 Structural Steel Connections

Bolts, nuts and washers shall be of the type specified or indicated. All nuts shall be equipped with washers except for high strength bolts. Beveled washers shall be used where bearing faces have a slope of more than 1:20 with respect to a plane normal to the bolt axis. Where the use of high strength bolts is specified or indicated, the materials, workmanship, and installation shall conform to the applicable provisions of the (RCRBSJ) Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts.

2.4.2 Bolt Holes

2.4.2.1 General

All bolt holes shall be accurately located, smooth, perpendicular to the

member, and cylindrical.

2.4.2.2 Holes for Regular Bolts

Holes for regular bolts shall be drilled and subdrilled and reamed in the shop and not be more than 1/16 inch larger than the diameter of the bolt.

2.4.2.3 Holes for Fitted Bolts

Holes for fitted bolts shall be match reamed or drilled in the shop. Burrs resulting from reaming shall be removed. The threads of bolts shall be entirely outside the holes. The body diameter of the bolt shall have tolerances as recommended by ANSI B4.1 for the class of fit specified assembly to provide an LN-2 fit.

2.4.2.4 Holes for High Strength Bolts

Holes for high strength bolts shall have diameters of not more than 1/16 inch larger than the bolt diameter. If the thickness of the material is not greater than the diameter of the bolt, the holes may be punched. If the thickness of the material is greater than the diameter of the bolt, the holes will be either drilled full-size or shall be subpunched or subdrilled at least 1/8 inch smaller than the diameter of the bolt and then reamed to full size. Poor matching of holes will be cause for rejection. Drifting done during assembly shall not distort the metal or enlarge the holes. For slight mismatching, reaming to a larger diameter for the next standard size bolt will be allowed.

2.5 SHOP ASSEMBLY

Unless otherwise specified, each machinery and structural unit furnished shall be assembled in the shop to determine the correctness of the fabrication and matching of the component parts. The tolerances shall not exceed those shown and each unit assembled shall be closely checked to ensure that all necessary clearances have been provided and that binding does not occur in any moving part. Assembly in the shop shall be in the same position as final installation (closed position) in the field unless otherwise specified. Assembly and disassembly work shall be witnessed by the Contracting Officer, unless waived in writing, and any errors or defects disclosed shall be immediately corrected. Before disassembly for shipment, each piece of a machine or structure shall be matchmarked to facilitate erection in the field. The location of matchmarks shall be indicated by circling with a ring of white paint after the shop coat of paint has been applied, or as otherwise directed.

2.6 MACHINE WORK

2.6.1 General

Unless otherwise shown on the shop drawings, all tolerances, allowances, and gauges for metal fits between plain, nonthreaded, cylindrical parts shall conform to ANSI B4.1 for the class of fit as shown or otherwise required. Where fits are not shown, they shall be acceptable to the Contracting Officer. Tolerances for machine-finished surfaces designated by non-decimal dimensions shall be within 1/64 inch. Sufficient machining stock shall be allowed on placing pads to ensure true surfaces of solid material. Finished contact or bearing surfaces shall be true and exact to secure full contact. Journal surfaces shall be polished and all surfaces shall be finished with sufficient smoothness and accuracy to ensure proper

operation when assembled. Parts entering any machine shall be carefully and accurately machined and all like parts shall be interchangeable provided that where parts are assembled together for drilling and/or reaming of holes or for machining, the parts will not be required to be interchangeable with like parts insofar as the assembled operation is concerned after this operation is completed. All drilled holes for bolts shall be accurately located.

2.6.2 Finished Surfaces

Surface finishes indicated or herein specified shall be in accordance with ASME B46.1. Values of required roughness heights are arithmetical average deviations expressed in micro inches. These values are maximum. Lesser degrees will be satisfactory unless otherwise indicated. Compliance with surface requirements shall be determined by sense of feel and visual inspection of the work compared to Roughness Comparison Specimens in accordance with the provisions of ASME B46.1. Values of roughness width and waviness height shall be consistent with the general type of finish specified by roughness height. Where the finish is not indicated or specified, it shall be that which is most suitable for the particular surface, provide the class of fit required, and be indicated on the shop drawings by a symbol which conforms to ASME B46.1 when machine finishing is provided. Flaws such as scratches, ridges, holes, peaks, cracks, or checks which will make the part unsuitable for the intended use will be cause for rejection. Surfaces to be machine finished shall be indicated on the shop drawings by symbols which conform to ASME B46.1.

2.6.3 Unfinished Surfaces

All work shall be laid out to secure proper matching of adjoining unfinished surfaces. Where there is a large discrepancy between adjoining unfinished surfaces, they shall be true to the lines and dimensions shown and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts shall be filled in an approved manner.

2.7 MISCELLANEOUS PROVISIONS

2.7.1 Zinc Coatings

Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM A 123. In all cases where zinc coating is destroyed by cutting, welding or other causes, the affected areas shall be regalvanized by the following methods. Coatings 2 ounces or heavier shall be regalvanized with a suitable low melting zinc base alloy similar to the recommendations of the American Hot-Dip Galvanizers Association to the thickness and quality specified for the original zinc coating. Coatings less than 2 ounces shall be regalvanized by a repair compound conforming to DOD-P-21035. The minimum thickness of the regalvanizing shall be 4 mils.

2.7.2 Cleaning of Corrosion Resisting Steel

Oil, paint and other foreign substances shall be removed from corrosion resisting steel surfaces after fabrication. Cleaning shall be done by vapor degreasing or by the use of cleaners of the alkaline, emulsion, or solvent type. After the surfaces have been cleaned, they shall be given a final rinsing with clean water followed by a 24-hour period during which the surfaces are intermittently wet with clean water and then allowed to dry for the purpose of inspecting the clean surfaces. The surfaces shall

be visually inspected for evidence of paint, oil, grease, welding slag, heat treatment scale, iron rust, or other forms of contamination. If evidence of foreign substances exist, the surface shall be cleaned in accordance with the applicable provisions of ASTM A 380. The proposed method of treatment shall be furnished for approval. After treatment, the surfaces shall be visually inspected. Brushes used to remove foreign substances shall have only stainless steel or nonmetallic bristles. Any contamination occurring subsequent to the initial cleaning shall be removed by one or more of the methods indicated above.

2.7.3 Protection of Finished Work

2.7.3.1 Machined Surfaces

Surfaces shall be thoroughly cleaned of foreign matter. All finished surfaces shall be protected by suitable means. Unassembled pins and bolts shall be oiled and wrapped with moisture resistant paper, or protected by other approved means. Finished surfaces of ferrous metals to be in bolted contact shall be washed with a rust inhibitor and coated with a suitable rust resisting compound for temporary protection during fabrication, shipping, and storage periods. Finished surfaces of metals which will be exposed after installation shall be painted as specified, except painting of corrosion resisting steel or nonferrous metals will not be required.

2.7.3.2 Lubrication

The arrangement and details for lubrications shall be as shown. Before erection of assembly, all bearing surfaces shall be thoroughly cleaned and lubricated with an approved lubricant. After assembly, all lubricating systems shall be filled with the lubricant specified and, as required additional lubricant shall be applied at regular intervals to maintain the equipment in satisfactory condition until acceptance of the work.

PART 3 EXECUTION

3.1 INSTALLATION

All parts to be installed shall be thoroughly cleaned. Packing compounds, rust, dirt, grit and other foreign matter shall be removed. Holes and grooves for lubrication shall be cleaned. Enclosed chambers or passages shall be examined to make sure that they are free from damaging materials. The Contracting Officer will inspect, prior to installation, units or items shipped as assemblies. Disassembly, cleaning, and lubrication will not be required except where there is indication that such work is necessary to place the assembly in a clean and properly lubricated condition. Pipe wrenches, cold chisels, or other tools likely to cause damage to the surfaces of rods, nuts, or other parts shall not be used for the work of assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly, but care shall be taken not to over stress the threads. When a half nut is used for the purpose of locking a full nut, the half nut shall be placed first and followed by the full nut. Threads of all bolts, except high-strength bolts, nuts and screws shall be lubricated with an approved lubricant before assembly. Threads of corrosion-resisting steel bolts and nuts shall be coated with a suitable anti-galling compound. Driving and drifting bolts or keys will not be permitted.

3.1.1 Alignment and Setting

Each machinery or structural unit shall be accurately aligned by the use of steel shims or other approved methods so that no binding in any moving parts or distortion of any member occurs before it is finally fastened in place. The alignment of all parts with respect to each other shall be true within the respective tolerances required. The machines shall be set true to the elevations shown.

3.1.2 Blocking and Wedges

All blocking and wedges used for the support during installation of parts to be grouted in shall be removed before final grouting, unless otherwise directed. Blocking and wedges left in the foundation with approval shall be of steel or iron.

3.1.3 Foundations and Grouting

Concreting of subbases and frames and the final grouting under parts of machines shall be in accordance with the procedures as specified in SECTION 03305: CONCRETE.

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DIVISION 05 - METALS

SECTION 05915

STOPLOGS

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SECTION 05915

STOPLOGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997a) Carbon Structural Steel
ASTM A 193	(2000) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

Detail drawings shall be submitted as specified in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

SD-03 Product Data

Welding; G

Schedules of welding procedures for structural steel and welding processes for aluminum shall be submitted as specified in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

Materials

Materials orders, materials lists and materials shipping bills shall be submitted as specified in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

Materials Disposition Records

A system of identification which shows the disposition of specific lots of approved materials and fabricated items in the work shall be established and submitted before completion of the

contract.

SD-06 Test Reports

Tests, Inspections, and Verifications

Certified test reports for material tests shall be submitted with all materials delivered to the site.

1.3 QUALIFICATION OF WELDERS AND WELDING OPERATORS

Qualification of welders and welding operators shall conform to the requirements of Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

1.4 DELIVERY, STORAGE AND HANDLING

Delivery, handling and storage of materials and fabricated items shall conform to the requirements specified in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

1.4.1 Rubber Seals

Rubber seals shall be stored in a place which permits free circulation of air, maintains a temperature of 70 degrees F or less, and prevents the rubber from being exposed to the direct rays of the sun. Rubber seals shall be kept free of oils, grease, and other materials which would deteriorate the rubber. Rubber seals shall not be distorted during handling.

PART 2 PRODUCTS

2.1 MATERIALS

Materials orders, materials lists and materials shipping bills shall conform to the requirements of Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.1.1 Metals

Structural steel and other metal materials sections and standard articles shall be as shown and as specified herein and in Section 05120, STRUCTURAL STEEL AND MISCELLANEOUS METALWORK.

2.1.1.1 Structural Steel

Structural steel shall conform to ASTM A 36/A 36M.

2.1.2 Rubber Seals

Rubber seals shall conform to the requirements in Section 05120, STRUCTURAL STEEL AND MISCELLANEOUS METALWORK.

2.1.2.1 Fabrication

Rubber seals shall have a fluorocarbon film vulcanized and bonded to the sealing surface of the bulb. The film shall be 0.030 or 0.060 inch thick Huntington Abrasion Resistant Fluorocarbon Film No. 4508, or equal, and shall have the following physical properties:

Tensile strength ..... 2,000 psi (min.)

Elongation ..... 250 percent (min.)

The outside surface of the bonded film shall be flush with the surface of the rubber seal and shall be free of adhering or bonded rubber. Strips and corner seals shall be molded in lengths suitable for obtaining the finish lengths shown and with sufficient excess length to provide test specimens for testing the adequacy of the adhesion bond between the film and bulb of the seal. At one end of each strip or corner seal to be tested, the fluorocarbon film shall be masked during bonding to prevent a bond for a length sufficient to hold the film securely during testing.

2.2 MANUFACTURED UNITS

Bolts, nuts, washers, screws and other manufactured units shall conform to the requirements specified and in Section 05501 METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS.

2.2.1 Stainless Steel Bolts

Stainless steel bolts shall conform to ASTM A 193 Grade B6 unless noted otherwise.

2.2.2 Screws

Screws shall be of the type indicated.

2.3 FABRICATION

2.3.1 Detail Drawings

Detail drawings of stoplogs and appurtenant shop fabricated items, including fabrication drawings, shop assembly drawings, delivery drawings, and field installation drawings, shall conform to the requirements specified and in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.1.1 Fabrication Drawings

Fabrication drawings shall show complete details of materials, tolerances, connections, and proposed welding sequences which clearly differentiate shop welds and field welds.

2.3.1.2 Shop Assembly Drawings

Shop assembly drawings shall provide details for connecting the adjoining fabricated components in the shop to assure satisfactory field installation.

2.3.1.3 Delivery Drawings

Delivery drawings shall provide descriptions of methods of delivering components to the site, including details for supporting fabricated components during shipping to prevent distortion or other damages.

2.3.1.4 Field Installation Drawings

Field installation drawings shall provide a detailed description of the

field installation procedures. The description shall include the location and method of support of installation and handling equipment; provisions to be taken to protect concrete and other work during installation; method of maintaining components in correct alignment; and methods for installing appurtenant items.

2.3.2 Structural Fabrication

Structural fabrication shall conform to the requirements specified and in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.3 Welding

Welding shall conform to the requirements specified in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.4 Bolted Connections

Bolted connections shall conform to the requirements specified in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.5 Machine Work

Machine work shall conform to the requirements specified in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.6 Miscellaneous Provisions

Miscellaneous provisions for fabrication shall conform to the requirements specified and in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.7 Fabrications

2.3.7.1 Stoplogs

Stoplogs shall be fabricated of structural steel conforming to ASTM A 36/A 36M. Steel items shall be galvanized where indicated.

2.3.7.2 Stoplog Guides

Stoplog guides shall be fabricated of structural steel conforming to ASTM A 36/A 36M.

2.3.7.3 Miscellaneous Embedded Metals

Corner protection angles, frames, base plates, and other embedded metal items required for complete installation shall conform to the details shown.

2.3.8 Seal Assemblies

Seal assemblies shall consist of rubber seals, stainless steel retainer and spacer bars, and fasteners. Rubber seals shall be continuous over the full length. Seals shall be accurately fitted and drilled for proper installation. Bolt holes shall be drilled in the rubber seals by using prepared templates or the retainer bars as templates. Splices in seals shall be fully molded, develop a minimum tensile strength of 50 percent of the unspliced seal, and occur only at locations shown. All vulcanizing of splices shall be done in the shop. The vulcanized splices between molded

corners and straight lengths shall be located as close to the corners as practicable. Splices shall be on a 45 degree bevel related to the "thickness" of the seal. The surfaces of finished splices shall be smooth and free of irregularities. Stainless steel retainer bars shall be field-spliced only where shown and machine-finished after splicing.

2.4 TESTS, INSPECTIONS, AND VERIFICATIONS

Tests, inspections, and verifications for materials shall conform to the requirements specified in Section 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall conform to the requirements specified and in Section 05501 METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS.

3.1.1 Embedded Metals

Corner protection angles, frames, base plates, and other embedded metal items required for complete installation shall be accurately installed to the alignment and grade required to ensure accurate fitting and matching of components. Embedded metals shall be given a primer coat of the required paint on all surfaces prior to installation in concrete forms. Anchors for embedded metals shall be installed as shown. Items requiring two concrete pours for installation shall be attached to the embedded anchors after the initial pour, adjusted to the proper alignment, and concreted in place with the second pour.

3.1.2 Seal Assemblies

Rubber seal assemblies shall be installed after the embedded metal components have been concreted in place and the gate installation, including painting, completed. Rubber seals shall be fastened securely to metal retainers.

3.1.3 Painting

Exposed parts of stoplogs and appurtenances except machined surfaces, corrosion-resistant surfaces, surfaces of anchorages embedded in concrete, rubber seals, and other specified surfaces shall be painted as specified in Section 09940 PAINTING - HYDRAULIC STRUCTURES AND APPURTENANT WORKS.

3.2 PROTECTION OF FINISHED WORK

Protection of finished work shall conform to the requirements specified in Section 05501 METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS.

3.3 ACCEPTANCE TRIAL OPERATION

After completion of installation, the Contracting Officer will examine the stoplog installation for final acceptance. The individual components of the stoplog installation will be examined first to determine whether or not the workmanship conforms to the specification requirements. The Contractor will be required to place the stoplogs in the guides a sufficient number of times to demonstrate that the stoplogs fit properly and seat uniformly.

Required repairs or replacements to correct defects, shall be made at no cost to the Government. The trial operation shall be repeated after defects are corrected.

-- End of Section --